A rough surface is inclined at an angle $\arcsin\left(\frac{3}{5}\right)$ to the horizontal.
A particle of mass 2kg is pulled 3m at a constant speed up the surface by a force acting along a line of greatest slope.
The only resistances to motion are those due to friction and gravity.
The work done by the force is 50J.
Calculate the coefficient of friction between the particle and the surface.

Q14-17

Energy

K.E. = $\frac{1}{2}mv^2$

Mass	Velocity	Kinetic Energy
10 kg	5 m/s	
2 tonnes	3 ms^{-1}	
4 kg	(3i – 4j) ms^{-1}	
20 kg	(-5i + 12j) m/s	

G.P.E. = mgh

Δ G.P.E. = work done against gravity = $mg(h_2 - h_1)$, if h_1=0 this gives us G.P.E. =mgh

Note: choose a 'zero level' of potential energy before calculating a particles gravitational potential energy

Ex 2B Q2, 3, 4, 5

Combining F=ma and $v^2 = u^2 + 2as$

A box of mass 1.5kg is pulled across a smooth horizontal surface by a horizontal force. The initial speed of the box is u ms^{-1} and its final speed is $3\mathrm{ms}^{-1}$. The work done by the force is 1.8J. Calculate the value of u.

A van of mass 2000kg starts from rest at some traffic lights. After travelling 400m the van's speed is $12ms^{-1}$. A constant resistance of 500N acts on the van. Calculate the driving force, which can be assumed to be constant.

A parcel of mass 3kg is pulled 10m up a plane inclined at an angle $\theta°$ to the horizontal, where $\tan\theta = \frac{3}{4}$. Assuming that the parcel moves up the line of greatest slope of the plane

(a) Calculate the potential energy gained by the parcel.

(b) What would the speed of the parcel be if the gain in gravitational potential energy was all transferred into kinetic energy.

Ex 2B Q7-11

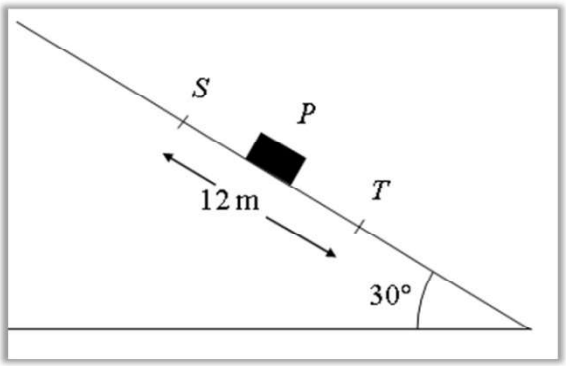
A small package P is modelled as a particle of mass 0.6 kg. The package slides down a rough plane from a point S to a point T, where $ST = 12$ m. The plane is inclined at an angle of 30° to the horizontal and ST is a line of greatest slope of the plane, as shown in Figure 3. The speed of P at S is 10 m s^{-1} and the speed of P at T is 9 m s^{-1}.

(a) Calculate the total loss of energy of P in moving from S to T,

(4)

(b) Given that the work done against friction by P is equal to total loss of energy of P in moving from S to T, calculate the coefficient of friction between P and the plane.

(5)



(a) KE lost is $\frac{1}{2}\times0.6\times(10^2-9^2)$ (= 5.7 J)
PE lost is $0.6\times9.8\times12\sin30°$ (= 35.28 J)
Total loss in energy is 41.0 (J)

(b) $R = 0.6\times9.8\times\cos30°$ (= 5.09)
WE: $40.98 = \mu\times0.6\times9.8\times\cos30°\times12$
$\mu = 0.97$ or 0.971